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The thermal CasimirPolder interaction of an atom with a spherical plasma shell

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Abstract

The van der Waals and CasimirPolder interaction energy of an atom with an infinitely thin sphere with finite conductivity is investigated in the framework of the hydrodynamic approach at finite temperature. This configuration models the real interaction of an atom with fullerene. The Lifshitz approach is used to find the free energy. We find the explicit expression for the free energy and perform its analysis for (i) high and low temperatures, (ii) large radii of the sphere and (iii) short separation between an atom and sphere. At low temperatures the thermal part of the free energy approaches zero as the fourth power of the temperature, while for high temperatures it is proportional to the first degree of the temperature. The entropy of this system is positive for small radii of the sphere and it becomes negative at low temperatures and for large radii of the sphere. © 2012 IOP Publishing Ltd.

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